

Name: _____

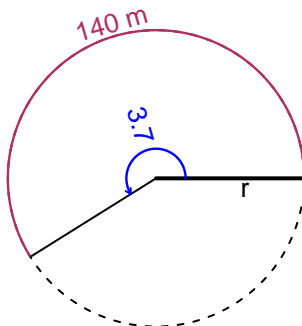
Date: _____

Trig Final (SLTN v611)

- You can use a calculator (like [Desmos](#))
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The arc length is 140 meters. The angle measure is 3.7 radians. How long is the radius in meters?

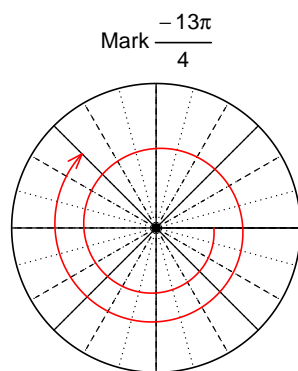


$$\theta = \frac{L}{r} \quad r = \frac{L}{\theta} \quad L = r\theta$$

$r = 37.84$ meters.

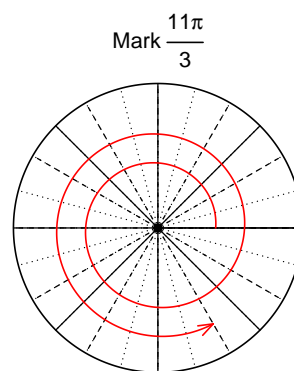
Question 2

Consider angles $-\frac{13\pi}{4}$ and $\frac{11\pi}{3}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(-\frac{13\pi}{4}\right)$ and $\cos\left(\frac{11\pi}{3}\right)$ by using a unit circle (provided separately).



Find $\sin(-13\pi/4)$

$$\sin(-13\pi/4) = \frac{\sqrt{2}}{2}$$



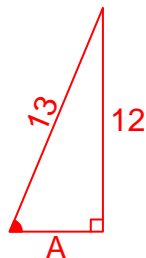
Find $\cos(11\pi/3)$

$$\cos(11\pi/3) = \frac{1}{2}$$

Question 3

If $\sin(\theta) = \frac{12}{13}$, and θ is in quadrant II, determine an exact value for $\cos(\theta)$.

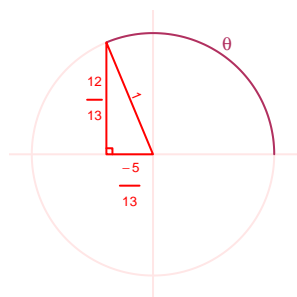
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$\begin{aligned}A^2 + 12^2 &= 13^2 \\A &= \sqrt{13^2 - 12^2} \\A &= 5\end{aligned}$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\cos(\theta) = \frac{-5}{13}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -5.39$ meters, an amplitude of 3.02 meters, and a frequency of 6.9 Hz. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -3.02 \cos(2\pi 6.9t) - 5.39$$

or

$$y = -3.02 \cos(13.8\pi t) - 5.39$$

or

$$y = -3.02 \cos(43.35t) - 5.39$$